SCRIPT

**Pathophysiology**

Type 2 diabetes is a chronic metabolic disorder. It is characterised by hyperglycaemia, insulin resistance and insulin deficiency. There are two types of diabetes, known as type 1 diabetes and type 2 diabetes. Type 2 diabetes makes up for 90% of the disease.

Type 2 diabetes is a condition where the hormone insulin which is produced by the pancreas does not work effectively. The pancreas is an organ that sits behind the stomach and secretes many things for digestion and also hormones for the maintenance of a person’s metabolism.

One of those hormones is insulin, which is produced as a response to high blood glucose levels. When we eat, we consume carbohydrates, which pass through the stomach into the small intestines and get broken down into glucose molecules, which are then diffused through the walls of the small intestines and into the blood stream. The blood is then carried off into the pancreas, where the pancreas reacts to the high glucose levels in the blood, and the beta-cells releases insulin into the blood stream.

Our body stores glucose in our liver and muscles, the cells of these have insulin receptors on them. This allows the insulin to interact with the insulin receptors, causing cells to allow the storage of glucose.

In a person with type 2 diabetes, the insulin receptors on the organ’s cells do not work efficiently, making them insulin resistant. This means that the glucose cannot enter these organs for storage, which will result in high blood glucose levels, known has hyperglycaemia.

Because there are high blood glucose levels, the beta-cells in the pancreas are told to release more insulin into the blood stream. With constant high glucose levels, the glucose will travel to the kidneys and will be secreted out, this is called glucosuria, which is the excretion of glucose into the urine.

Glucosuria will result in osmotic diaresis. This is because, glucose will drag fluids with it because it is a solute, which causes the person to need to urinate more, which is called polyuria. Due to the need to constantly urinate, the person will lose fluids and electrolytes quickly. This will lead to dehydration and a hyperosmolar state, which is a medical emergency.

The dehydration will stimulate the brain to want to consume more water, which is called polydipsia, and due to the insulin resistance, it can actually cause a condition called polyphagia, which is the feeling of hunger. This is because the organs that would usually store the glucose react to the lack of glucose they are receiving and send the signal to the brain, telling it to consume more food, resulting in polyphagia.

After a long time of insulin resistance, the cells in the pancreas that release the insulin will start to fail, because they’re over working, because the body is not reacting to the insulin properly (Sheehan and Ulchaker, n.d.) (Saisho, 2015), (Ferrannini, 2011), (Forster, 1956), (Robertson, 1988).

**DIFFERENTIAL DIAGNOSIS**

Looking into the differential diagnosis, there are a number of pathologies that the patient may be presenting with. It could be considered that obesity, osteoarthritis and trochanteric bursitis are the most likely causes in this particular case, due to their link with type 2 diabetes.

 So, A likely pathology that the patient may be presenting with is obesity, a medical condition where people carry additional body weight. When there is an overload of weight onto the joints, this causes stress and pressure in its attempt to support this weight and will in turn cause pain.

Another pathology that could be considered highly common for this particular patient is osteoarthritis, a condition where there is a degeneration of joint cartilage. Research suggests that individuals with type 2 diabetes are highly likely to develop osteoarthritis, as many people with type 2 diabetes are overweight. In turn, putting pressure onto the joints and the cartilage.

Another very common cause of hip pain is bursitis; which is the inflammation of the bursa. Bursitis can be caused due to over-use of the muscles, tendons and ligaments over the bursa. Due to the fact that there is a high chance that the presenting patient is overweight, this can cause overuse of the bursa, in attempt to support the excessive weight. This causes the bursa to inflame and makes movements at the joint painful.

Other common causes of hp pain that are not necessarily directly linked to type 2 diabetes are FAI, synovitis, and chronic gluteal tendinopathy.

Research suggests that Femoral acetabular impingement (known as FAI), a condition were extra bone growths around the hip joint, as well as Synovitis; the inflammation of the synovial membrane, can be a common cause of hip pain. Research suggests that both of these pathologies have links osteoarthritis. Therefore, due to the fact that osteoarthrosis is commonly associated with type 2 diabetes, it can be depicted that both FAI and Synovitis may also be apparent in the patient.

Another common pathology that causes hip pain is Chronic gluteal tendinopathy, the most common tendinitis in the hip. This is where there is inflammation in the tendons. Usually, this takes many tiny tears to continually happen over time to cause this pathology. The excessive weight the patient may be holding could be a reason as to why the tendons are constantly being torn.

Finally, pathologies that shouldn’t be missed are—

(Okifuji & Hare, 2015), (Hosalkar, Pandya, Bomar & Wenger, 2012), (Nurkovic et al., 2016), (Griffin & Huffman, 2016), (Segal et al., 2007), (Astur et al., 2016), (Battaglia, D’Angelo & Kettner, 2016), (Hall & Anderson, 2013), (Sharfman et al., 2016), (Nelitz et al., 2009), (Moya-Angeler, 2015), (McCarthy, Noble & Villar, 2016).

**CLINICAL ASSESSMENT**

within the clinical assessment, there are a number of things we would test for and look out for to depict what the most likely pathology is.

Thinking about Osteoarthritis, we would look out for pain, stiffness, lack of ROM, grinding, bone spurs, swelling and pain when walking.

Looking into obesity, we would want to look into the patients BMI, exercise levels, body fat percentage (using a skin fold calliper or a body composition machine,) and their weight to height comparison.

Looking into trochanteric bursitis, we would mainly look out for pain when walking or lying down on the injured side.

When looking into FAI, we would look for a positive FADIRs test, and whether they had previously had SCFE in their childhood, as this is commonly associated with developing FAI in later life. We would also look out for pain after walking or prolonged sitting, locking, or clicking. The pain usually feels to be in the inner hip.

Thinking about labral tears, a positive FADIRs test is also an indication that the patient would be presenting with a labral tear. In order to distinguish between whether the patient had either FAI or a labral tear, we would use the rest of the clinical assessment discovering their symptoms to distinguish between the pathologies.

When considering chronic gluteal tendinopathy, we would look for hip pain when walking, lateral hip pain, pain at night, stiffness at night and/or when you wake up in the morning, and a positive Resisted External rotation test.

(Nuttall, 2015), (Nurkovic et al., 2016), (Shanmugaraj et al., 2018), (Mathiessen & Conaghan, 2017), (Groh & Herrera, 2009), (Allison et al., 2018).

EFFECTS OF TREATMENT

Type 2 diabetes is a contraindication to many treatments, such as electrotherapy, massage, physical therapy/rehabilitation, cryotherapy and thermotherapy, all due to the fact that they may have altered sensation.

Regarding electrotherapy, if the patient has altered sensation, they will not be able to feel if there is any burning or tingling from the treatment. This may cause irritation and/or injury to the area being treated.

 If getting a massage, the patient may not be able to feel the pressure correctly and/or their pain. So, when the therapist is asking the patient about the pressure and pain during the massage, their answers cannot be considered accurate and therefore this may result in injury.

With cryotherapy and thermotherapy, if someone has altered sensation, they may not be able to feel the temperature. So, there is no way of telling whether the patient is experiencing any abnormal feelings, or, whether the treatment has caused any damage, again, resulting in injury.

Regarding physical therapy/rehabilitation those with type 2 diabetes are more likely to be overweight, therefore their movements will be more restricted. As well, it is highly unlikely that the patient already takes part in exercise, therefore, their lack of technique and stamina may also cause injury.

All of these treatments are still able to be performed on patients with diabetes. With electrotherapy, cryotherapy and thermotherapy, therapists should perform a sensation test on the individual before treatment. As long as the patient can feel the difference between hot and cold, the treatment is considered to be safe. Considering physical therapy/rehabilitation, the patient should be guided by a professional to decrease the risk of injury.

(Rask-Madsen and King, 2013), (Bobola et al., 2018), (An et al., 2018), (Pietiläinen et al., 2008), (Farahbod, 2014).

CONCLUSION

Ultimately, the most likely reason for the patient’s hip pain is that there is a high probability that they are overweight and are therefore putting pressure on the hip joint; causing pain. Regarding treatment, advising the patient to seek a nutritionist and/or personal trainer could significantly help decrease the patient’s pain.

It could be advised that the client visits the Change4Life type 2 diabetes page online (Mayo Clinic, 2019), and/or the diabetes.co.uk website for guidance (Nhs.uk, 2019).

Reference

* Allison, K., Hall, M., Hodges, P., Wrigley, T., Vicenzino, B., & Pua, Y. et al. (2018). Gluteal tendinopathy and hip osteoarthritis: Different pathologies, different hip biomechanics. *Gait & Posture*, *61*, 459-465. doi: 10.1016/j.gaitpost.2018.02.011
* Allison, K., Hall, M., Hodges, P., Wrigley, T., Vicenzino, B., Pua, Y., Metcalf, B., Grimaldi, A. and Bennell, K. (2018). Gluteal tendinopathy and hip osteoarthritis: Different pathologies, different hip biomechanics. *Gait & Posture*, 61, pp.459-465.
* An, Y., Kang, Y., Lee, J., Ahn, C., Kwon, K. and Choi, C. (2018). Blood flow characteristics of diabetic patients with complications detected by optical measurement. *BioMedical Engineering OnLine*, 17(1).
* Astur, D., Zanatta, F., Arliani, G., Moraes, E., Pochini, A., & Ejnisman, B. (2016). Stress fractures: definition, diagnosis and treatment. *Revista Brasileira De Ortopedia (English Edition)*, *51*(1), 3-10.
* Battaglia, P., D’Angelo, K., & Kettner, N. (2016). Posterior, Lateral, and Anterior Hip Pain Due to Musculoskeletal Origin: A Narrative Literature Review of History, Physical Examination, and Diagnostic Imaging. *Journal Of Chiropractic Medicine*, *15*(4), 281-293.
* Bobola, M., Chen, L., Ezeokeke, C., Kuznetsova, K., Lahti, A., Lou, W., Myroniv, A., Schimek, N., Selby, M. and Mourad, P. (2018). A Review of Recent Advances in Ultrasound, Placed in the Context of Pain Diagnosis and Treatment. *Current Pain and Headache Reports*, 22(9).
* Farahbod, F. (2014). The Efficacy of Thermotherapy and Cryotherapy on Pain Relief in Patients with Acute Low Back Pain, a Clinical Trial Study. *Journal of  clinical and diagnostic research.*
* Ferrannini, E. (2011). Learning From Glycosuria: FIG. 1. *Diabetes*, 60(3), pp.695-696.
* Forster, R. (1956). osmotic diuresis and its effect on total electrolyte distribution in plasma and urine of the aglomerular teleost, lophius americanus. *The Journal of General Physiology*, 39(3), pp.349-359.
* Griffin, T., & Huffman, K. (2016). Editorial: Insulin Resistance: Releasing the Brakes on Synovial Inflammation and Osteoarthritis?. *Arthritis & Rheumatology*, *68*(6), 1330-1333.
* Groh, M. and Herrera, J. (2009). A comprehensive review of hip labral tears. *Current Reviews in Musculoskeletal Medicine*, 2(2), pp.105-117.   Hall, M., & Anderson, J. (2013). Hip Pointers. *Clinics In Sports Medicine*, *32*(2), 325-330.
* Hosalkar, H., Pandya, N., Bomar, J., & Wenger, D. (2012). Hip impingement in slipped capital femoral epiphysis: a changing perspective. *Journal Of Children's Orthopaedics*, *6*(3), 161-172.
* Mathiessen, A., & Conaghan, P. (2017). Synovitis in osteoarthritis: current understanding with therapeutic implications. *Arthritis Research & Therapy*, *19*(1).
* Mayo Clinic. (2019). *Diabetes - Symptoms and causes*. [online] Available at: <https://www.mayoclinic.org/diseases-conditions/diabetes/symptoms-causes/syc-20371444> [Accessed 10 Dec. 2019].
* McCarthy, J., Noble, P., & Villar, R. (2016). *Hip joint restoration: Worldwide Advances in Arthroscopy, Arthroplasty, Osteotomy and Joint Preservation Surgery*. America: Springer.
* Moya-Angeler, J. (2015). Current concepts on osteonecrosis of the femoral head. *World Journal of Orthopedics*, 6(8), p.590.
* Nelitz, M., Lippacher, S., Krauspe, R. and Reichel, H. (2009). Perthes Disease. *Deutsches Aerzteblatt Online*.
* Nhs.uk. (2019). *About Change4Life - Change4Life*. [online] Available at: <https://www.nhs.uk/change4life/about-change4life> [Accessed 10 Dec. 2019].
* Nurkovic, J., Jovasevic, L., Konicanin, A., Bajin, Z., Ilic, K., Grbovic, V., Skevin, A. and Dolicanin, Z. (2016). Treatment of trochanteric bursitis: our experience. *Journal of Physical Therapy Science*, 28(7), pp.2078-2081.
* Nuttall, F. (2015). Body Mass Index. *Nutrition Today*, *50*(3), 117-128.
* Okifuji, A., & Hare, B. (2015). The association between chronic pain and obesity. *Journal Of Pain Research*, 399.
* Pietiläinen, K., Kaprio, J., Borg, P., Plasqui, G., Yki-Järvinen, H., Kujala, U., Rose, R., Westerterp, K. and Rissanen, A. (2008). Physical Inactivity and Obesity: A Vicious Circle. *Obesity*, 16(2), pp.409-414.
* Rask-Madsen, C. and King, G. (2013). Vascular Complications of Diabetes: Mechanisms of Injury and Protective Factors. *Cell Metabolism*, 17(1), pp.20-33.
* Robertson, G. (1988). Differential Diagnosis Of Polyuria. *Annual Review of Medicine*, 39(1), pp.425-442.
* Saisho, Y. (2015). β-cell dysfunction: Its critical role in prevention and management of type 2 diabetes. *World Journal of Diabetes*, 6(1), p.109.
* Segal, N., Felson, D., Torner, J., Zhu, Y., Curtis, J., Niu, J., & Nevitt, M. (2007). Greater Trochanteric Pain Syndrome: Epidemiology and Associated Factors. *Archives Of Physical Medicine And Rehabilitation*, *88*(8), 988-992.
* Shanmugaraj, A., Shell, J., Horner, N., Duong, A., Simunovic, N., Uchida, S. and Ayeni, O. (2018). How Useful Is the Flexion–Adduction–Internal Rotation Test for Diagnosing Femoroacetabular Impingement. *Clinical Journal of Sport Medicine*, p.1.
* Sharfman, Z., Atzmon, R., Rotem, G., Drexler, M., Haviv, B., Amar, E. and Rath, E. (2016). Hip arthroscopy for intra-capsular benign tumors: a case series. *Journal of Hip Preservation Surgery*, p.hnw025.
* Sheehan, J. and Ulchaker, M. (n.d.). *Obesity and type 2 diabetes mellitus*.